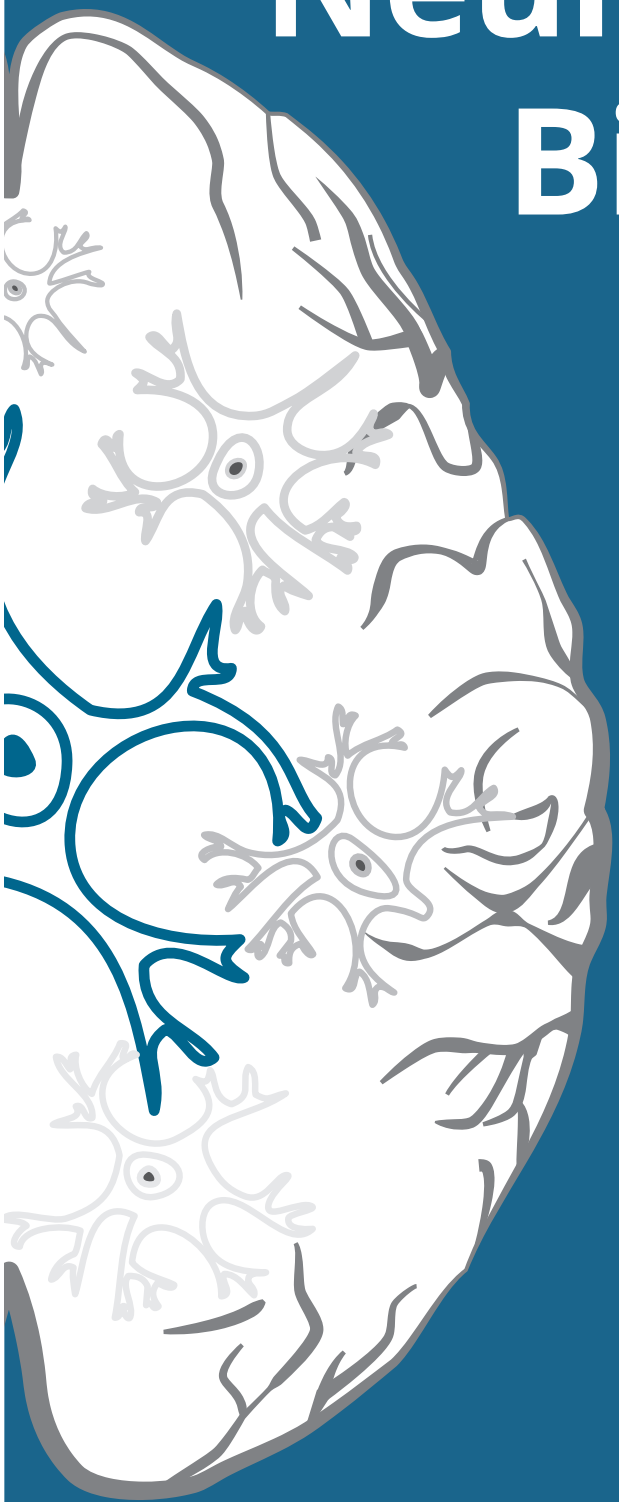
NeuroDoWo Bielefeld



PROGRAMME

Dear all,

Welcome to the NeuroDoWo 2016!

It is our pleasure to host the 27th edition of the Neurobiology Doctoral Student Workshop (NeuroDoWo) at Bielefeld University/CITEC. Since 1990, the NeuroDoWo is organized by PhD students for PhD students. It aims at providing an excellent networking platform for early career scientists from different fields of neuroscience in Germany and around the world and stimulating open discussions about PhD projects without the feeling of being evaluated by supervisors.

This year, you will present your research with a talk or a poster on Thursday and Friday. There is plenty of room for lively discussions and networking during and after the talk and poster sessions. To that end, we have organized three social events: A welcome barbecue on Wednesday evening, a buffet dinner on Thursday and a dinner in downtown Bielefeld on Friday. Make sure you join us!

In addition, it is our distinct honor to welcome three renowned scientists for further stimulating input: Prof. Dr. Martin Egelhaaf will talk about motion sensing and navigation in insects on Wednesday, Dr. James Poulet will talk about cortical sensory integration in the mouse forepaw system on Thursday, and Prof. Dr. Albert Newen will discuss animal cognition on Friday.

Thank you for your participation! We wish you a pleasant and fruitful time,

Your organizing team.

Bielefeld 2016

Olivier Bertrand

Chris J. Dallmann

Catharina Glowania

Arne Gollin

Simon Jetzschke

Frauke Lauterbach

Gaëtan Lepreux

Valerie Lucks

Shirley Mey

Dylan Cheng

Welcome to Bielefeld

For years, conspiracy theorists have been spreading the virtual rumour that Bielefeld is only a figment of the imagination in keeping with the motto, "Bielefeld? There's no such place!". That's far from being true, as you will see.

Some 330,000 people live here, making Bielefeld one of the twenty biggest cities in Germany. Founded in 1214 as merchant city, Bielefeld emerges today as a dynamic university city with a total of seven universities and nearly 35,000 students. Over the next few years Campus Bielefeld will be developed into one of the most modern university locations in the whole of Germany. Welcome to the heart of the East Westphalia-Lippe region, home to a number of big names and world-class companies including Dr. Oetker, Seidensticker and Schüco.

The Teutoburg Forest defines Bielefeld's cityscape and ensures splendid panoramic views – a perfect location for recreational activities as hiking, running, climbing and cycling. Nature trails and scenic routes provide opportunities to explore Bielefeld and its surrounding area. Located next to one of the most beautiful ridge walks in Germany is the Sparrenburg. The castle provides the impressive backdrop for the annual medieval spectacular, and serves as the town's landmark.

Crowd-puller of all in all 15 museums is Kunsthalle Bielefeld, presenting nationally respected exhibitions and fine architecture, just below the Sparrenburg. Bielefeld's diverse cultural scene offers a wide range of events over the whole year – whether in theatres, art galleries, streets or on the city's spacious squares. By the way: the small but fine stage of Bunker Ulmenwall is home to international and local big names in jazz music.

Welcome to CITEC

Everything from everyday appliances to robots: researchers at the Cluster of Excellence Center in Cognitive Interactive Technology (CITEC) at Bielefeld University develop technical systems that are intuitive and easy to operate for human users. Future technology should adapt to the human user – not the other way around.
Since 2007, researchers have been investigating the scientific principles necessary for endowing machines with cognitive abilities. These machines should be able to interact naturally with people and adjust to changing situations. Researching the scientific foundations of cognitive interaction technology, a research area founded by CITEC, is the necessary pioneering work.

Interdisciplinary research activities at CITEC are organized into four main areas: motor intelligence, attentive systems, situated communication, and memory and learning. The round about 250 members hail from 29 research groups and five faculties: Biology, Linguistics and Literary Studies, Mathematics, Psychology and Sports Science, and Technology.

The CITEC anchors in top-class research through the “virtual faculty”, comprised of 43 leading international experts from the field of cognitive interaction technology. The integrated Graduate School has about 100 doctoral candidates and offers a cross-faculty qualification in this interdisciplinary research area.

CITEC partners with the strategic partners from industry, economy and social welfare and health care like the Bodelschwingh Foundation Bethel, Miele, Bertelsmann, and the Honda Research Institute.

As part of the Excellence Initiative of the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG), CITEC is funded by the state and federal governments.

General Information

Accommodation

Bielefeld JBB Jugendgästehaus
Herrmann-Kleinewächter-Straße 1
33602 Bielefeld
+49 (0)521 522050

We reserved rooms at the youth hostel for you. Make sure to check-in as member of the NeuroDoWo group. Room allocation is up to you. You will receive breakfast at the hostel every morning.

Conference Venue

CITEC - Cognitive Interaction Technology Cluster of Excellence
Inspiration 1
33619 Bielefeld

The conference takes place around the lecture hall in the foyer of the CITEC building. Parking in front of the building is possible. We strongly recommend to use public transport to commute between the hostel and the conference area. The best connection is via tram line 4, which is connecting the city centre to the university (direction Lohmannshof). After a 10 minute ride it is only a 5 minute walk to the CITEC. For more information take a look at our city and university maps.

Public Transport

Bielefeld has a very good public transport system and one of the shortest Tram networks in germany. All public transport is managed by Mobiel. Tickets for the Tram can be bought at each station, tickets for the bus at the driver. All current information and routes can be found on www.mobiel.de
An easy to use app to find the next-best public transport is the free Deutsche Bahn (DB) App.

Language

The official meeting language is english.

Talks

Talks are scheduled as 15 minute presentations with an additional 5 minutes of discussion. We ask you politely to keep to time in order to avoid delays in the tight schedule. You can bring your own computer, we will also provide a computer with Powerpoint and Keynote. Please verify that your presentation is working before your session starts.

Posters

Posters will be presented directly in front of the CITEC lecture hall and are scheduled in two sessions, one taking place on Thursday, the other on Friday. Please be at your poster during your poster session if you want to present and discuss your research. Independent of the sessionw we would like to leave the posters up for the whole duration, so please put up your poster already on Thursday. Posterwalls are numbered, pins or adhesive tape will be available. Don't forget to take down your poster Friday evening.

Socials

We will have a welcome BBQ at the conference venue on Wednesday. Drinks and food will be provided.
On Thursday, we will organize a Wrap-buffet at the conference venue, drinks are included.
After the plenary lecture on Friday, we will go to the Brauhaus in downtown Bielefeld, which serves traditional German plain fare. We ordered dishes according to your reservations prior to the workshop. After each dinner, we welcome you to join us in grabbing a drink in downtown Bielefeld

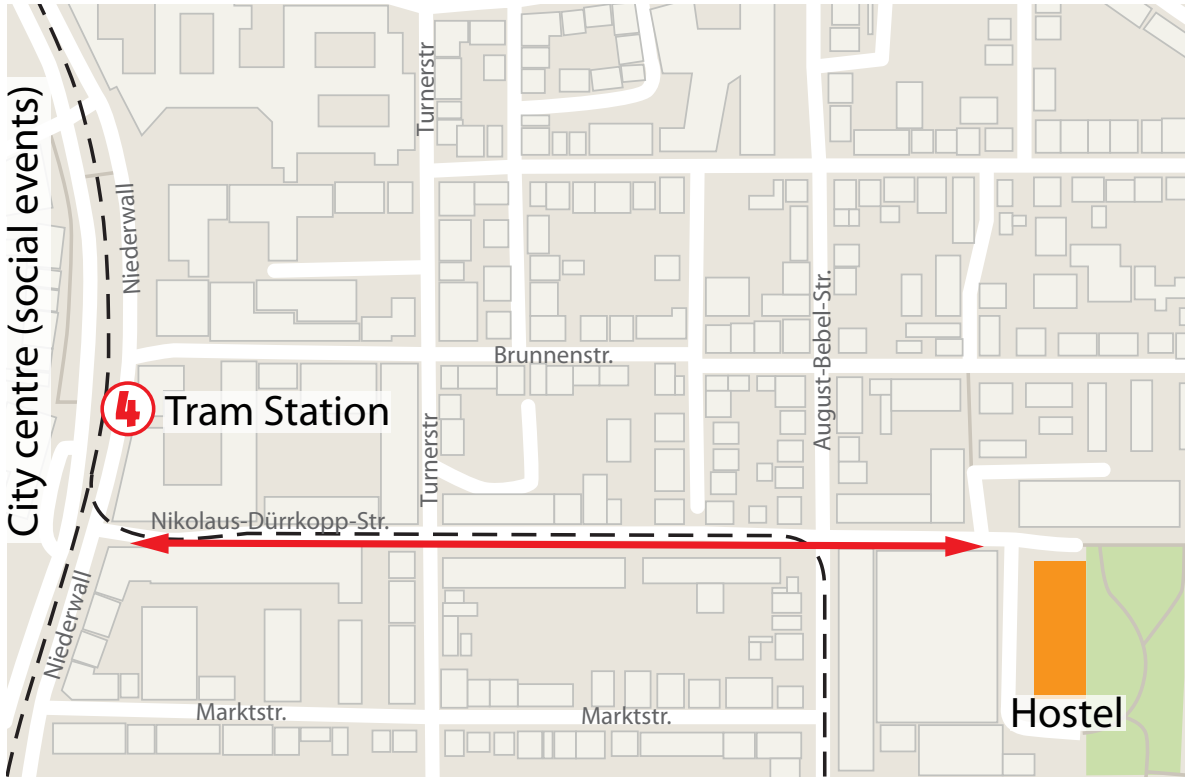
Useful Numbers

Emergency: 112
Police: 110
Taxi: +49 (0)521 97111
Hostel: +49 (0)521 522050

City Map and Directions

Getting to the hostel

Upon arriving at the central station, take the main exit and continue straight to the underground tram station. You can take any line going via Rathaus (town hall). Leave the tram at Rathaus and follow the Nikolaus-Dürrkopp-Str until you reach the hostel. You are right if you pass below a bridge-like structure reading 'Dürrkopp'.

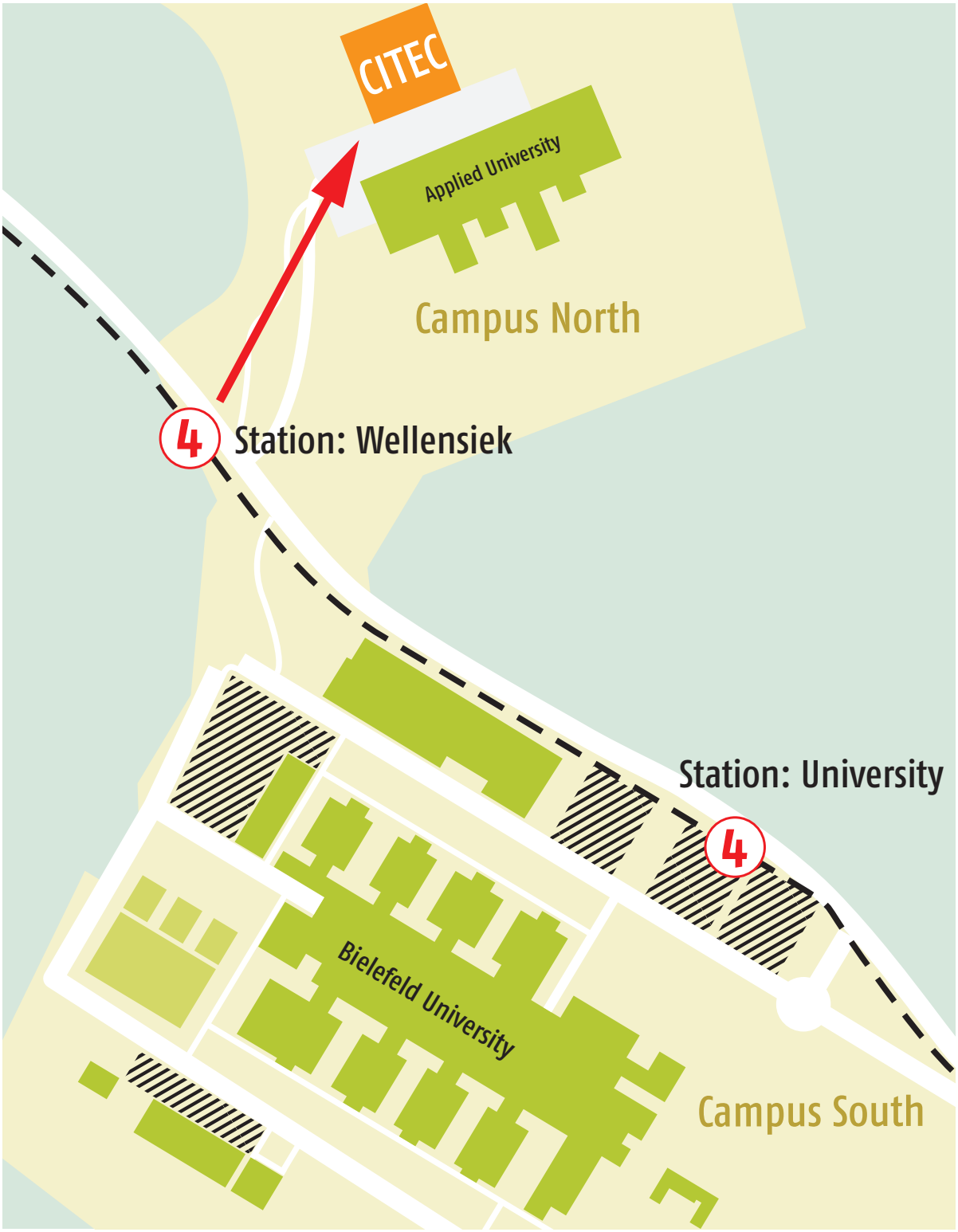


Getting to the conference venue

Take the same route from the hostel back to the station 'Rathaus'. Tram line 4 (red number) will bring you to the university. Please exit the tram at 'Wellensiek' and follow the signs directing you to CITEC and the University of Applied Sciences. The CITEC-building is the black, smaller building on the left.

You can buy tickets at every station. A ticket costs currently 2.40€ and is valid for 90 minutes of unlimited travel around the city.

Campus Map


CITEC
Applied University
Campus North
4
Station: Wellensiek
Station: University
4
Bielefeld University
Campus South

Wednesday, 5 pm, CITEC lecture hall

Moving the eyes: From motion sensing to navigation in cluttered environments

Prof. Dr. Martin Egelhaaf

Neurobiology & Center of Cognitive Interaction Technology (CITEC), Bielefeld University, Germany

Despite their miniature brains insects, such as flies and bees, are able to perform highly aerobatic flight maneuvers and thereby solve spatial vision tasks, such as avoiding collisions with stationary obstacles, landing on objects, or localizing previously learned inconspicuous goals in cluttered environments even over large distances. To accomplish their extraordinary performance, insects rely on spatial information that is contained in the retinal motion patterns ("optic flow") generated on the eyes during locomotion. The optic flow is shaped by the characteristic dynamics of behavioral actions as well as by the structure of the environment and, thus, has very peculiar spatiotemporal properties that facilitate extraction of spatial information from the optic flow patterns ("active vision strategy"). The talk will highlight what is known from electrophysiological experiments and modeling about the computational mechanisms extracting this actively generated environmental information by the insect brain and how this information might be used to solve behavioral tasks. It will be shown that, by making use of the behaviorally generated dynamics of the retinal image flow, insects are capable of performing extraordinarily well with minimal computational effort. The computationally parsimonious principles underlying biological active vision strategies may be employed when designing artificial lightweight robotic systems.

GEMEINNÜTZIGE
Hertie
Stiftung

Die Gemeinnützige Hertie-Stiftung ist eine der größten weltanschaulich unabhängigen und unternehmerisch ungebundenen Stiftungen in Deutschland.
Sie wurde 1974 von den Erben des Kaufhausinhabers Georg Karg ins Leben gerufen und engagiert sich mit ihren Mitarbeitenden und ihrem Vermögen in den Arbeitsgebieten Neurowissenschaften, Gesellschaftliche Innovationen sowie Bildung.
Die Projekte und Initiativen der Stiftung leisten wissenschaftlich basierte und praxisorientierte Beiträge zur Lösung drängender Probleme unserer Gesellschaft.
Sie haben sowohl zum Ziel, die Qualität des öffentlichen Diskurses zu verbessern, als auch in der Praxis modellhafte Lösungsansätze zu schaffen. Diese können und sollen von anderen übernommen werden. Entsprechend fördert und fordert die Hertie-Stiftung Eigeninitiative und Hilfe zur Selbsthilfe.

www.ghst.de

Thursday, 11 am, CITEC lecture hall

Cortical sensory integration in the mouse forepaw system

Dr. James Poulet

Neural Circuits and Behaviour, Max Delbrück Center For Molecular Medicine, Berlin, Germany

We use the mouse forepaw somatosensory system to examine neural mechanisms of sensory perception and motor control. In particular we study the primary somatosensory and primary motor cortical regions associated with the forepaw. We train mice to report sensory stimulation of the paw by licking or reaching and pressing a sensor and then record and manipulate the activity of genetically identified cortical neurons during these behaviors to attempt to uncover the neural computations underlying sensory perception and behavior. In this talk I will describe two projects, the first about the cortical circuits involved in thermal processing and perception, and a second about the transformation of tactile sensory input to movement output by forelimb motor cortical neurons.

NEUROWISSENSCHAFTLICHE GESELLSCHAFT

Friday, 4:30 pm, CITEC lecture hall

Animal Cognition: Is there a feature that marks an anthropological borderline?

Prof. Dr. Albert Newen

Ruhr-Universität Bochum, Bochum, Germany

In the last two decades we have witnessed the emergence of radically new insights concerning the cognitive abilities of animals. Considering some new insights especially in birds, dogs and monkeys, I am discussing the recent candidates for an anthropological borderline between human and nonhuman animals. It is argued by induction on the basis of significant examples that for all features (as candidates for an anthropological borderline) we find astonishing roots in nonhuman animals. If we account for the top-level abilities of the most advanced nonhuman species (including systematic training of the animals) the suggested borderline tends to be uninterestingly high because it excludes human children up to a certain age who are still lacking these abilities. If we account for a gradual and species-specific development of cognition in evolution and ontogeny (even with significant small steps), the best we can do to compare species is to develop species-specific profiles concerning relevant cognitive abilities. Comparing species would then take place by comparing these profiles while we should give up the idea that any one of the cognitive features alone would allow us to mark an anthropological borderline.

Talks Schedule

Thursday, starting 9:30 am

T1: Charalampos Mantziaris
Weak Central Coupling between Contralateral Depressor Motor Activities in the Deafferented Walking System of the Stick Insect

T2: Anna C. Schneider
Characterization of Neurotransmitters in a Network of Coupled Oscillators

T3: Olga Dyakova
Influence of image statistics on active behavior and visual responses in hoverflies

T4: Meike Scheller
Neural development of non-visual multisensory integration in sighted and non-sighted individuals

Thursday, starting 1:30 pm

T5: Niels Niethard
Sleep stage-specific regulation of cortical excitation and inhibition

T6: Alina Graf
How attention modulates activity in the visual cortex and the connection to working memory capacity

T7: Jonas Hornung
Emotional attention and chemosensory signals: how does androstadienone affect attention and neural activation in women and men?

T8: Mina Elhamiasl
The effect of interpretation modification on attention bias toward health related information and emotion regulation in patients with health anxiety

Thursday, starting 4:45 pm

T9: Björn Trebels
Postmetamorphic plasticity of the mushroom bodies'

T10: Benjamin H. Paffhausen
Neuronal correlates of social interactions in honeybees

T11: Max Diesner
Identification and quantification of biogenic amines from individual Drosophila somata by MALDI-TOF MS.

T12: Julia Sprenger
An illustrative approach to metadata management for electrophysiological experiments

Talks Schedule

Friday, starting 9:30 am

T13: Sara Hänzi
Interactions between vestibular stimulation and locomotor corollary discharge in Xenopus laevis tadpoles

T14: Roman Goulard
Visuo-Inertial stabilization in flying insects: looking for vertical reference

T15: Kristina Corthals
Head-body-coordination in walking Drosophila melanogaster

Friday, starting 11:00 am

T16: Olivier Bertrand
Remember the route between home and work

T17: Simon Jetzschke
Finding Home: The influence of landmark ambiguity on human navigation?

T18: Catharina Glowania
Haptic shape adaptation is not object dependent

T19: Daniela Buchwald
Vision vs. Touch: Does the type of sensory information alter the way primates plan grasps?

Friday, starting 2 pm

T20: Shirley Mey
Braintracking. How do we get an alternative communication tool?

T21: Marie Oulé
Dendritic intrinsic excitability of the mature granule cells of the dentate gyrus

Weak Central Coupling between Contralateral Depressor Motor Activities in the Deafferented Walking System of the Stick Insect

Charalampos Mantziaris, Anke Borgmann, Till Bockemühl and Ansgar Büschges

Deparment of Animal Physiology, University of Cologne, Cologne, Germany

Activity coupling between central pattern generating networks (CPGs) is essential for generating a coordinated and behaviorally relevant locomotor output. Numerous studies have highlighted the importance of sensory input for CPG coordination, especially in terrestrial locomotion. However, information regarding contribution of central coordinating mechanisms remains highly elusive. Here, we used the deafferented central nervous system of Carausius morosus to investigate central interactions between contralateral CPGs that control movement of the coxa-trochanter (CTr) joint in all thoracic segments. CTr-joint CPG output was assessed by recording activity of motoneurons (MNs) that innervate the depressor trochanteris muscles, both in isolated and interconnected thoracic ganglia . Rhythmic motor activity in leg MN pools was induced by application of 5×10-3 M pilocarpine. Potential coupling interactions were determined by either phase analysis of the evoked rhythmicity or correlation of contralateral depressor spike activities. To elucidate the neural mechanisms underlying CPG coordination, we recorded intracellularly with sharp electrodes from meso-thoracic MNs and interneurons. Despite considerable variability in phase differences and frequency ratios between contralateral motor activities, phase difference distributions showed distinct preferences in all segmental ganglia. Interconnected meso- and meta-thoracic ganglia showed intermittent sequences of clear in-phase activity, characterized by stable rhythmicity and increased coupling strength.
Our results reveal weak intra-segmental coupling between hemi-segmental CTr-joint CPGs in the activated stick insect thoracic nerve cord. In interconnected ganglia we find a preference for inter- and intra-segmental in-phase activity. This does not resemble any of the known coordination patterns in insect walking. It is conceivable though that the observed coordination can support the observed intersegmental co-activation of segmental muscles, captured in the fifth Cruse rule (Cruse 1990).

Characterization of Neurotransmitters in a Network of Coupled Oscillators

Anna C. Schneider, Susanne Neupert, and Carmen Smarandache-Wellmann

Animal Physiology, Zoological Institute, University of Cologne, Cologne, Germany

Animal behavior is governed by the activity of neurons and the interplay of neural networks. Merely knowing the connections between neurons in a network is not enough to understand the interaction between the neurons and generation of the network's activity patterns: The action of different neurotransmitters can drastically alter the network's output.
Here, we used the crayfish swimmeret system to study coordination of distributed neural oscillators using electrophysiology, immunocytochemistry, and mass spectrometry. Each oscillating module includes three neurons that enable coordination. The presynaptic Ascending (ASCE) and Descending Coordinating Neurons (DSC) of one module send coordinating information to the postsynaptic Commissural Interneuron 1 (ComInt 1) of another module. We hypothesized that ASCE and DSC use low molecular weight transmitters because their spikes elicit fast, distinct EPSPs in ComInt 1.
In our electrophysiological experiments focal and bath application of glutamate (DNQX) or GABA antagonists (picrotoxin) changed neither EPSP size nor shape. Furthermore, immunocytochemical experiments using antisera against serotonin revealed no co-localization with the intracellularly stained coordinating neurons. Hence, these compounds could be excluded as putative neurotransmitters of ASCE and DSC. Using a combination of electrophysiological recording, intracellular dye injection for cell identification, and direct single cell MALDI-TOF mass spectrometry we were able to identify acetylcholine (ACh) as putative transmitter in both ASCE and DSC. Further experiments by immunostainings against ACh can verify our findings with MALDI-TOF MS.

Influence of image statistics on active behavior and visual responses in hoverflies

Olga Dyakova, Karin Nordström

Uppsala University, Uppsala, Sweden

Natural scenes, which are encountered by freely flying flies, can be described in terms of their statistics. It has been shown that one of the second-order statistics – the slope of the average amplitude spectrum (often called the alpha-value) - of natural scenes has a peak around 1.2 [1, 2].
We have recently found that a hoverfly higher-order visual neuron (cSIFE) is inhibited by a range of natural scenes and that this inhibition is strongly dependent on the alpha-value [2]. Moreover, using a trackball setup
[3] we have shown that hoverflies' optomotor response is influenced by image statistics [1].
We also performed a fieldwork study where we investigated two types of hoverfly behaviors: hovering and flying. Preliminary results suggest that there is a significant difference in image statistics between photos of
the ground over which hoverflies were either hovering or flying.

1. Dyakova, O., Longden, K. D., Lee, Y.J., V.G. Kiselev & Nordström, K., A higher order visual neuron tuned to the spatial amplitude spectra of natural scenes. Nat. Commun.

2. Tolhurst, D., Tadmor, Y. & Chao, T. Amplitude spectra of natural images. 12, 229–233 (1992).

3. Longden, K. D., Muzzu, T., Cook, D. J., Schultz, S. R. & Krapp, H. G. Nutritional state modulates the neural processing of visual motion. Curr. Biol. 24, 890–5 (2014).

Neural development of non-visual multisensory integration in sighted and non-sighted individuals

Meike Scheller[1], Karin Petrini[1], Michael Proulx[1] and Michelle de Haan[2]

1 Department of Psychology, University of Bath, Bath, United Kingdom
2 Developmental Cognitive Neuroscience Unit, Institute of Child Health, University College London, London, United Kingdom

Interaction with the world around us is part of our daily lives. In order to do so in a meaningful way we have to get a precise and accurate representation of this world. Integrating information from multiple senses is known to increase perceptual accuracy and precision. However, in typically developing humans the ability to improve precision through integration of sensory cues develops rather late (Gori et al., 2008; Petrini et al., 2014). Developmental delays in optimal multisensory integration can arise from sensory calibration processes, whereby the more robust sense teaches the less robust sense. But what if one sense is lost or absent – how does this impact the integration of information in the remaining senses? In this project I will investigate whether blind and visually impaired individuals, who depend largely on their remaining senses, develop optimal audio-haptic sensory integration at an earlier age compared to healthy individuals or if this form of integration is impaired due to disturbance of sensory recalibration during development. By employing a ball size discrimination game I will gather behavioural as well as EEG data to examine if, and at what age, audio-haptic integration develops in non-sighted individuals. Knowing how the neural development differs between sighted and non-sighted individuals is essential to develop successful sensory substitution devices for the blind (Proulx et al, 2014). Furthermore, it is crucial to understand at what age blind children can gain from using both senses, as earlier training and intervention might be possible and optimal.

Sleep stage-specific regulation of cortical excitation and inhibition

Niels Niethard[1], Masashi Hasegawa[2], Takahide Itokazu[2], Carlos N. Oyanedel[1], Jan Born[1,2], Takashi R. Sato[2,3]

1Institute for Medical Psychology and Behavioral Neurobiology, University of Tübingen, Germany.
2Center for Integrative Neuroscience, University of Tübingen, Germany.
3 Japan Science and Technology, Tokyo, Japan

Sleep is characterized by unique patterns of cortical activity alternating between the stages of slow wave sleep (SWS) and rapid-eye movement (REM) sleep. How these patterns relate to the balanced activity of excitatory pyramidal cells and inhibitory interneurons in cortical circuits is unknown. We investigated cortical network activity during wakefulness, SWS, and REM sleep globally and locally using in vivo calcium imaging in mice. Wide-field imaging revealed a reduction in neural activity during SWS, compared with wakefulness and, unexpectedly, a further profound reduction in activity during REM sleep. Two-photon imaging on local circuits showed that this suppression during REM sleep was associated with reduced activity of pyramidal cells, accompanied by activation of PV+ interneurons, but not SOM+ interneurons. PV+ interneurons most active during wakefulness were also most active during REM sleep. Our results reveal a sleep-stage specific regulation of the cortical excitation/inhibition balance, with PV+ interneurons conveying maximum inhibition during REM sleep, which might help shape memories in these networks.

How attention modulates activity in the visual cortex and the connection to working memory capacity

Alina Graf

Deutsches Zentrum für Neurodegenerative Erkrankungen, Germany

Working memory allows us to maintain and manipulate information online that is crucial for behavior. Being of limited capacity, the ability to retain relevant information varies greatly between individuals. Studies have shown that individuals with a high working memory capacity are able to disregard distracting information in contrast to low-capacity individuals, who encode distractors just like target stimuli. It thus seems that one key factor, which distinguishes high-capacity from low-capacity individuals, is the ability to prioritize information. This filtering of data already begins at the level of perception. When we attend a specific area of the visual field, our brain enhances the processing of the attended region and decreases the processing of the surrounding areas. This regulation is particularly pronounced if there are distracting stimuli nearby the target stimulus. It has been shown that the magnitude of this so-called top-down modulation of retinotopic visual areas varies robustly between individuals. We hypothesize that this attentional modulation process influences the extent of the individual working memory capacity. We will therefore measure the individual visuo-spatial working memory capacity of healthy young subjects. For the extreme high-capacity and the extreme low-capacity individuals we will then assess the magnitude of the attention regulated top-down modulation of the retinotopic visual areas using a visual paradigm in fMRI scan. The analysis will then show whether the ability to prioritize information on the level of perception influences the working memory capacity.

Emotional attention and chemosensory signals: how does androstadienone affect attention and neural activation in women and men?

Jonas Hornung[1], Lydia Kogler[1], Andreas Bartels[2], Manfred Hallschmid[3], Vanessa Nieratschker[1], Stephan Wolpert[4], Jessica Freiherr[5,6], Birgit Derntl[1]

1 Department of Psychiatry and Psychotherapy, University of Tübingen, Tübingen, Germany,
2 Werner Reichardt Centre for Integrative Neuroscience, Tübingen, Germany,
3 Institute for Medical Psychology and Behavioural Neurobiology, University of Tübingen, Tübingen, Germany,
4 University Department of Otolaryngology, Head and Neck Surgery, University of Tübingen, Tübingen, Germany,
5 Diagnostic and Interventional Neuroradiology, RWTH Aachen University, Aachen, Germany,
6 Fraunhofer Institute for Process Engineering and Packaging IVV, Freising, Germany

Chemosensory signals play an important role in the social interaction of many animal species. They signal danger, fear and sexual interest and are emitted via glands in the skin. While the connection of odors and behavior is well investigated in animals, in humans little is known about the influence of chemosensory signals on social and emotional processes.
The chemosignal receiving most attention in this regard is a substance called androstadienone (ANDR). This androgen steroid can be found in male sweat, saliva and semen and has been shown to alter emotional processing in men and women, i.e. under ANDR human subjects take longer to disengage from emotional information like angry or happy faces. ANDR has also been found to affect physiological reactions and mood in a gender specific manner, i.e. increasing negative mood in men and increasing positive mood in women. Another recent finding is that heterosexual women rate male faces more attractive under ANDR.
In this PhD project we investigate the effect of ANDR on different processes of emotional attention in healthy women and men.
Based on previous findings, we expect that ANDR attracts attention to emotional stimuli. Whether this effect is similarly strong in women and men and whether neural activation is affected by ANDR application has yet to be investigated. This project is novel as no other study before has taken this integrative approach to investigate gender differences by applying methods of cognitive psychology (behavior), systems neurobiology (functional brain imaging) and molecular neurobiology (hormone sampling, genotyping).

The effect of interpretation modification on attention bias toward health related information and emotion regulation in patients with health anxiety

Mina Elhami Asl[1,2], Ali Khatibi[1,2], Mohsen Dehghani[3]

1 Neuroscience Department. Bilkent University. Ankara, Turkey
2 National Magnetic Resonance Research Center (UMRAM). Bilkent University. Ankara, Turkey
3 Psychology Department, Shahid Beheshti University. Tehran. Iran

Health anxiety refers to worries about an illness that may lead to the misinterpretation of bodily sensations as symptoms of a serious disease. Considering the suggested role of interpretation bias in development and maintenance of health anxiety, different psychotherapy protocols aim to modify these biases through reappraisal technics. However, the underlying mechanisms of these changes are not well investigated and an interaction between these biases and other cognitive processes, such as selective attention, are hypothesized to play a role. Since negative appraisal of health related information will increase attention bias toward health-threatening stimuli, it seems interpretation modification might improve attention bias and consequently lead to less anxiety.
Method: To study this hypothesis, 60 patients with health anxiety will be selected. These participants will be divided into three groups: Interpretation modification, Sham interpretation modification, and control group. In order to reduce clinician bias and increase the validity of the study, we are going to develop a computer task that focus on modification of interpretation bias. Before and after treatments, attention bias, emotion regulation and symptoms of all participants will be evaluated using Dot probe task, ERQ and HAI.
Expected results: We expect interpretation modification task through replacing more appropriate reappraisals significantly reduces the difference in reaction time to health related and non-health related stimuli, reflecting the improvement in attention bias toward health threatening information. We also expect this intervention increase positive emotion regulation strategies such as cognitive reappraisal and reduce maladaptive ones including avoidance or suppression. This cognitive reappraisal will then lead to successive down-regulation of anxiety about health.

Postmetamorphic plasticity of the mushroom bodies

Björn Trebels[1], Stefan Dippel[2], Ernst A Wimmer[2], Joachim Schachtner[1]

1 Philipps-University Marburg, Department. of Biology, Animal Physiology, Marburg, Germany
2 Georg-August-University Göttingen, Department of Developmental Biology, Johann-Friedrich-Blumenbach-Institute of Zoology and Anthropology, GZMB, Ernst-Caspari-Haus, Göttingen, Germany

With its fully sequenced genome and the susceptibility for reverse genetics based upon RNA interference (RNAi), Tribolium castaneum is best suited to study the development and plasticity of the nervous system. While plasticity can be provided by various mechanisms, we focus on ongoing cell proliferation in the adult brain. It is well established that neurogenesis persists in the mushroom bodies (MB) of adult insects, including beetle T. castaneum where neuroblasts giving birth to MB Kenyon-cells remain active for more than one month after adult eclosion. To label cell proliferation in the adult beetle we successfully adapted the 5-ethyl-2'-deoxyuridine (EdU) technique to living beetles. Combined with immunohistochemistry against the glia-cell marker reversed-polarity and the use of transgenetic lines expressing neuron- and/or glia-specific markers, we labeled the progenies of adult persisting neuroblasts, determined their identity and counted the newborn Kenyon cells in within the first week after adult eclosion to determine the proliferation rate.
In several studies it was proposed that newborn neurons of MBs may play a role during olfactory processing and learning. We combined the EdU-staining with olfactory stimulation using the leaf alcohol cis-3-hexen-1-ol and again determined the proliferation rate. Our data suggest at least two phases. Direct after adult eclosion, proliferation is independent from stimulation with the leaf alcohol, while after about three days, proliferation is influenced by olfactory stimulation.
To further investigate MB plasticity, we plan to use other odors, including the beetle's aggregation pheromone 4,8-dimeythydecanal (DMD), odor deprivation and knockdown of Orco via systemic RNAi.

Neuronal correlates of social interactions in honeybees

Benjamin H Paffhausen, Inga Fuchs, Randolf Menzel

Institute of Biology, Neurobiology, Freie Universität Berlin, Germany

So far no data exist about the neural correlates of social interaction in the honeybee. We record from multiple mushroom body extrinsic neurons during social interaction in a small functioning honeybee colony. The bees cared for the queen, nursed the brood, guarded the exit, cleaned the hive and foraged. The colony used the honeycombs as they would naturally. The recorded animal is freely moving and interacts with colony members. The weight of the highly flexible twisted triple of wires was counterbalanced by a lose nylon spring. The behavior of both the recorded animal and the hive mates was monitored in infrared light by a video camera and tracked. Social interactions were categorized and correlated with the neurons activities. Up to 4 neurons were recorded simultaneously and lasted for up to 48 hours per animal. Spontaneous spike rates were lower than those of similar neurons in harnessed bees. Neural activity increases frequently during interactions. Furthermore, we find that the variance of spike activity of the units increases suggesting that the neurons sense or controls the contacts with other bees. Hints were found that different activity patterns across neurons changes with different forms of social interactions. Ongoing analyses, that include machine learning, are pursued to clarify whether the activity changes are related to, for example, the origin of the approaching bee or the division of labor within the bee colony. The highly variability of neural activity needs further analyses.

Identification and quantification of biogenic amines from individual Drosophila somata by MALDI-TOF MS.

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Biogenic amines represent a diverse group of neurotransmitters, -modulators and -hormones which are synthesized and released by neurons, influencing physiological processes and shaping behavioral patterns in organisms. Detection of biogenic amines by mass spectrometry from a small sample size such as a single cell body is still a challenging analytical task. While a MALDI-TOF MS-based method for detection of neuropeptides on single cell level has been published [1], an equivalent approach for the detection and quantification of smaller neurotransmitter such as biogenic amines is lacking to date.
Here, we introduce a robust and reproducible protocol by using on-plate chemical derivatization with 4-hydroxy-3-methoxycinnamaldehyde to decrease the limit of detection; first focusing on octopamine (OA) and tyramine (TA) (limit of detection OA 1 fmol/µl, TA 2.5 fmol/µl); without interruption of the detection of putative neuropeptides in the same sample set. The strategy contains quantification experiments with internal standards which shows an excellent linearity (R^2>0.999) and a limit of quantification of 10 fmol/µl for OA and TA, respectively.
Analyzes of individual dissected somata from two discrete tyraminergic/octopaminergic neuron populations, the VL cluster at the protocerebrum and the VMlb cluster of the suboesophageal ganglion, revealed a highly significant difference in OA level between the two cell population (t-test, p=4.373e-8, VL n=12, VMlb n=7).
Further experiments will include behavioral assays to study putative differences in OA/TA expression on somata level to get a more detailed understanding about their influence in the nervous system.

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An illustrative approach to metadata management for electrophysiological experiments

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The generation and accumulation of data is a common feature in all scientific endeavors. These primary data, and subsequent data resulting from post-processing steps, should always be accompanied by information about the origin of the data. This information is typically recorded as metadata and is essential for reproducible data analysis, for facilitation of the communication between members of a project, and ultimately to support later accessibility of recorded data. In neuroscience, and in particular experimental neurophysiology, the development of a common approach to metadata management is still an ongoing effort.

We present here an easy-to-use approach for metadata generation for neuroscientific data in the context of two electrophysiological use cases and illustrate how we can apply a common metadata framework to store metadata records. Our approach is based on odML (open metadata Markup Language), i.e. a hierarchical XML-based metadata format which
was designed to represent complex metadata collections. However, both use cases revealed that manually generating and filling an odML metadata document is not sufficiently solved without extensive programming knowledge, with the consequence of effectively preventing the use of the odML framework. To overcome this challenge, we developed odML-tables, a
software solution that emerged from this observation and is designed to bridge the gap between classical hierarchical representations of odML and a flat, tabular counterpart, which is well-suited for manual entry using common graphical software tools (Microsoft Excel, LibreOffice Calc). We show how odML-tables complements a sustainable workflow for
metadata management in the two use cases.

Interactions between vestibular stimulation and locomotor corollary discharge in Xenopus laevis tadpoles

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Tadpoles of Xenopus laevis possess two mechanisms for gaze stabilization: first, the vestibuolo-ocular reflex (VOR) compensates the direction of gaze in response to external movement which is sensed as vestibular stimulation; second, corollary discharge (CD) from the spinal cord causes compensatory eye movements during swimming. Previous studies have shown that no VOR in the horizontal plane can be elicited during swimming, implying that horizontal vestibular inputs are cancelled. However, the vertical VOR is not (completely) cancelled. The present experiments aim to elucidate the details of the interaction between the CD and the cancellation of the VOR: how specific is the cancellation of vestibular inputs? Electrophysiological experiments were carried out in in-vitro preparations of Xenopus laevis, in which we recorded fictive swimming activity as well as the eye movement motor commands, which represent the readout of the VOR. Natural linear stimulation was employed to see whether the VOR from the otolith organs was cancelled by CD; preliminary results suggest this is not the case and the suppression of vestibular inputs is at least specific to the semicircular canals. Galvanic vestibular stimulation (GVS) allowed specific stimulation of the semicircular canals. Here, it appears that the interactions between swimming and vestibular stimulation are complex: swimming and GVS are not independent factors, since GVS often elicits swimming, and likely facilitates the transmission of the CD. Nevertheless it appears that the VOR elicited by GVS is at least also somewhat suppressed, if not completely cancelled. Cancellation of vestibular inputs by CD therefore seems to encompass all semicircular canals.

Visuo-Inertial stabilization in flying insects: looking for vertical reference

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Flying insects' aptitude to perform hovering, automatic landing and tracking tasks involves accurately controlling their head and body roll and pitch movements, but how this attitude control depends on different sensorimotor loops [1] is still an open question. Visual and inertial feedback loops based on state change compensation are well documented [2], but they can be submitted to an error accumulation or a drift leading to instability. Therefore we focused on the possible existence of an absolute vertical reference in insects.
In a first part, we studied graviception in insects. Gravity perception in flying insects has mainly been studied in terms of grounded animals' tactile orientation responses [3], but it has not yet been established whether hoverflies use it as a reference to control their flight. An earth-based free fall procedure was developed with which flying insects can be briefly exposed to micro-gravity under various visual conditions. The insects' free fall detection and crash avoidance performances in various visual environments suggest the existence of a multisensory control system based mainly on vision rather than gravity perception [4].
In a second part, we investigate the vision as the dominant sense for flight control. We used a well-known paradigm in insects, the Dorsal Light Response [1,5], which leads to the realignment of the head with a light source or an artificial horizon. By reversing the horizon we show that this reflex does not rely only on vision but that it is probably combined with proprioception (i.e., measurement of head-body orientations by means of the prosternal organs in the fly's neck). This multisensory combination could lead to an interesting way to estimate a vertical reference [6].

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Head-body-coordination in walking Drosophila melanogaster

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Due to the small stereobasis and interocular overlap, most insects lack stereoscopic vision. Therefore, other cues for distance estimation become prevalent as for example the retinal image shift by self-motion. During translational movements, close objects will travel faster across the retina than distant ones, whereas during rotational movement all objects move with the same speed. Therefore, only translational movements provide distance information1. Insects overcome this problem by using a saccadic strategy, which consists of very short and fast rotations, called saccades2,3, that disrupt long translational movements. This strategy has been found in different insects 4–6.

Here, we show that walking Drosophila melanogaster perform body saccades, without the typical head saccades described for other insects4. This was also paired with the absence of haltere movement during walking, which seems to coordinate head movement in other insects. Modeling of the visual field of Drosophila revealed that head movements affect the retinal input only marginally.

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Remember the route between home and work

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Central-place foragers, such as bees and ants, travel back and forth between food locations and their nest. To reach their goal they tend to follow idiosyncratic routes. Several visual mechanisms underlying route learning and following have previously been proposed. However one may follows a route without remembering at each decision point, the direction to go. Indeed the agent may use a predefined direction when non-remembered decision points are encountered along the route. For example, in cluttered environments the animal does not need to remember decision points when the route direction is aligned with the predefined direction: minimizing the risk of a collision. The predefined direction can be either based on the geometry of the environment (e.g. avoiding collision), or other properties (e.g. the shape of objects). If animals are displaced from their learned course, e.g. by a gust of wind, they need to regain it by some search strategy. Is it therefore safe to memorize only part of a route? If so, what predefined direction should be used? These questions are addressed here by a graph representation of virtual environments. We found that it is recommended to learn most of the route. Moreover, the closer the animal is to its route – but not on the route – the more important it is to learn the route entirely. Finally, we found that the predefined direction does not play a significant role. Therefore, we should memorize most of the route not to stay lost.

Finding Home: The influence of landmark ambiguity on human navigation?

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Spatial navigation tasks often require the ability to memorize the location of a goal often using sensory information from multiple sources. Information about movement and posture of the body can originate in the senses of the human body. External reference points, such as landmarks or beacons, however, convey information about the spatial position of the individual in given surroundings. Landmarks are ambiguous, though, if they are not unique or combined with additional information. How does this ambiguity affect the accuracy and precision in human navigation?
To study the influence of landmarks in human navigation we tested the same experimental paradigm in two different senses, audition and vision. Participants learned the position of a goal, determined by a number of landmarks. Participants were then relocated to a new position and had to return to the goal location. We tested the performance (a) with blindfolded participants and auditory landmarks and (b) seeing participants in a virtual-reality setup with visual landmarks.
We found that participants were unable to resolve the ambiguity of auditory landmarks in order to locate the position of the goal when the landmarks were not individually identifiable. Also visual landmarks are ambiguous and the participants' performance is closely linked to the ambiguity of the landmarks. We believe that humans could use a method called template matching, which is a well-studied mechanism in insects, to locate the position of the goal. Humans could also learn individual landmarks and compare their sensory input with the previously acquired information to find reliable and useful landmarks. What homing strategies are used when humans are uncertain about the information available?

Haptic shape adaptation is not object dependent

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When touching a slanted surface, the impression arises that after a period of time the surface appears less slanted or even level (adaptation). If subsequently presented with a physically level surface, this surface will be perceived as slanted in the opposite direction (adaptation aftereffect). Haptic shape perception, however, relies on both posture information as well as cutaneous (touch) information. The question arises whether haptic shape adaptation is object or posture based. If haptic adaptation is object-related it should only occur if an object is actively touched. Posture adaptation should affect haptic shape perception regardless of whether an object is touched during adaptation.

To address this question, participants adapted to a virtual slant using the index fingers of both hands. In one condition, adaptation was induced by actively touching the surface (object present) in a second condition, participants adapted by keeping their fingers in mid-air at indicated locations (object absent). Results showed adaptation aftereffects for both adaptation conditions to equal extents, regardless of whether an object was present or not. This indicates that haptic shape adaptation can be fully explained by posture adaptation (proprioception). This implies that object constancy heavily depends on previous postures being similar.

Vision vs. Touch: Does the type of sensory information alter the way primates plan grasps?

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Object recognition describes the ability to identify objects and their physical properties. Although the correct recognition of objects is an important task for most animals, especially with regard to manipulation and interaction, the exact representation of such object recognition in the brain has not yet been extensively studied. Likewise, it is unknown whether grasping for visually and tactually perceived objects is planned differently in the brain.

In my project, we explore these object representations in the brain of rhesus macaques. The monkeys perform a grasping task, in which they have to lift objects. These objects were either perceived visually or tactually beforehand. In the tactile subtask, the monkey will first gather tactile information in the dark to plan the grasp more efficiently. In the visual subtask, the object is enlightened for a short time, before the monkey has to grasp it in the dark.

While the animal performs this task, we record from the brain areas F5, AIP, M1, S1 and S2. These regions are related to the planning and execution of grasping movements and to visual and tactile perception of objects and are therefore relevant targets for the electrophysiological recordings in this project. Importantly, the neural signals in both tasks will be compared to determine whether different activity patterns exist for these conditions.

These experiments will shed new light on visual and tactile object recognition and its use for grasp motor planning.

Braintracking. How do we get an alternative communication tool?

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Interaction with machines is more and more common. The communication can be done in different ways. It is possible to use speech, gestures, other body language, or especially to communicate with machines, keyboard entries. All this methods interrupt your situation. Also for using supporting machines or robots for handicapped people, this methods are sometimes hard to use and also show a very obvious use of supportive techniques. An alternative method, is our brain activity recorded by encephalography (EEG). This method is more or less independent from languages or personal abilities regarding normal communication advantages, and because of this independence, a method which can be used from all people with different native languages or disabilities.

We want to find a multimodal solution for distinguishing and acting with different types of objects in a real life environments, to provide useful information for human machine interactions.

Because we want to use this technique in real life situations we want to investigate a method that is independent from artificial markers to detect event-related potentials. That's is why we wanted to use events which are produced by the participants itself. Based on prior studies we decided to use fixation onsets to measure event-related potentials (ERPs). First results show significant differences in the brain activity in particular regions when fixating task relevant objects compared to irrelevant objects. These results give us a neurocognitive signature of task-relevance in real life situations.

Dendritic intrinsic excitability of the mature granule cells of the dentate gyrus

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The DG is one of the few brain regions where neurogenesis takes place. Thus, the DG is composed of a small population of immature GCs and a majoritarian population of mature GCs. Apart from their differences in morphology, it has been described that mature GCs display reduced synaptic plasticity compared to the immature GCs. Despite the large representation of the mature GCs in the DG and because immature GCs seem to be particularly excitable and plastic, the past decades of research have mainly focused on the relevance of these immature GCs in memory formation. Some studies even suggested that mature GCs could be considered as retired cells, and that the memory function of the DG would only rely on immature GCs. However, this hypothesis is highly debated in the field. Several studies have recently drawn the attention on another form of plasticity: intrinsic plasticity. Indeed, modifications of the intrinsic excitability, notably within the dendritic compartment, have been demonstrated to importantly modulate the synaptic plasticity and the processing of signals from dendrites to the soma. Alterations of the intrinsic excitability can be achieved by modifications of the properties of different channels, notably the potassium channels, expressed along the dendrites. Thus, this project aims to (1) determine the relevance of dendritic intrinsic plasticity of the mature granule cells regarding memory; (2) assess the role of potassium channels in the regulation of dendritic intrinsic properties.

Poster Schedule

Thursday

P1: Inga Fuchs:
Low cost open source hardware and software in behavioral and electrophysiological experiments: Arduino & Raspberry Pi

P3: Felix Blumenthal:
Detecting synapses to understand a coordinating network

P5: Robert Kossen:
Neurolgin4-deficient flies: Too dense or too deaf to mate?

P7: Joscha Schmitz:
Movement Feedback Signal Processing in a Curve Stepping Stick Insect: Task and Segment Specific.

P9: Laura Schläger:
Ionic currents during rhythm generation and coordination of activity

P11: Felix Clotten:
The Effect of Descending Input on a Locomotor System

P13: Valerie Lucks:
Adaptation-induced modification of motion selectivity tuning in visual tectal neurons of adult zebrafish

P15: Rumeysa Gunduz-Can:
Grasping Re-planning Interferes with Working Memory during the Maintenance Process: Neurophysiological Evidence

P17: Jing Huang:
Age-related changes in saccadic adaptation

P19: Emmanuel Antwi-Adjei:
Circuit Analyses of consolidated memory in Drosophila.

P21: Martin Müller:
Where to place my home in a cluttered environment? A model analysis.

Poster Schedule

Friday

P2: Chris J Dallmann
A fast, local, load-based mechanism for inter-leg coordination in freely walking insects

P4: Charlotte Doussot
Active vision strategies of bumblebees during learning flights

P6: Frederick Zittrell
Receptive fields of polarization-sensitive neurons of the central complex in the desert locust

P8: Jinglin Li
Modeling motion adaptation in the visual system

P10: José Monteagudo
On the role of vision and gravity in head-body coordination of freely walking blowflies

P12: Frauke Lauterbach
Optic flow based distance coding in the H1 cell of the blowfly

P14: Gaëtan Lepreux
Passive versus active sensing: a giant descending interneuron in a stick insect conveying information about antennal movement.

P16: Anna Metzger
Haptic aftereffect of softness

P18: Dylan Ming-Yang Cheng
Enhancing Golf Putting Performance by Neurofeedback Train

P20: Arne Gollin
A Multisensory Compass for Indoor Navigation

P22: Corinna Osterbrink and Aykut Kurt
Multisensory integration of both ON and OFF-stimuli via correlation detection

Low cost open source hardware and software in behavioral and electrophysiological experiments: Arduino & Raspberry Pi

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Behavioral science can be accelerated greatly by the use of digitally controlled devices capable of measuring relevant parameters and, if necessary, interact with the experiment. Those machines can be bought and they can do things in an implemented way. They are however neither cheap nor as adaptive as they should be. The focus of this poster is to demonstrate how to overcome the rather small barriers in order to develop their own machines. Recently, open hardware projects like the Arduino or the Raspberry Pi draw enormous community coding and building elements that can be fused together to fit the experimenters needs. We as scientists can benefit from large numbers of projects that are documented well in the internet, mostly by tutorial videos including component lists and code. Here we present a number of simple suggestions how to build yourself helpful devices for your behavioral and neurophysiological experiments.

Poster

Detecting synapses to understand a coordinating network

Felix Blumenthal, CR Smarandache-Wellmann

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During swimming the four paired swimmerets of the crayfish's abdomen are coordinated in an anteriorly proceeding metachronal wave. Each swimmeret is innervated by neurons from its own module, containing a central pattern generator (CPG). The intersegmental coordination of four ipsilateral, anatomically separated CPGs is achieved by three neurons located in each hemisegment forming a coordinating circuit. One ascending (ASCE) and one descending (DSC) coordinating neuron encode the information about the status of their home module and project it to the other ganglia. A nonspiking neuron, Commissural Interneuron 1 (ComInt1), decodes this information transmitted by three neighboring coordinating neurons with a gradient of synaptic strength and integrates it into its own CPG.
Here we want to investigate if the gradient of synaptic strength is due to the morphology of synaptic contacts. For these experiments, ComInt1 and coordinating neurons were filled with fluorescent dye and the presynaptic boutons of the coordinating neurons on ComInt1 were marked immunohistochemically with Anti-Synapsin.
The axons of the coordinating neurons run dorsally, parallel to the midline through each segment. ComInt1 has its soma in one hemisegment, sends its primary neurite dorsally over the midline to the lateral neuropil on the contralateral side. Additionally ComInt1 has one ascending and one descending dendritic branch parallel to the midline and to the axons of the coordinating neurons.
At the midline we identified synapses of the coordinating neurons by colocalized presynaptic boutons with an intracellular stained axon. The colocalizations were dorsally all along and strictly parallel to the midline of the ganglion. These colocalizations do not yet explain the three distinct sizes of EPSPs in ComInt1 but it is a first approach to investigate this morphologically.

Neurolgin4-deficient flies: Too dense or too deaf to mate?

Robert Kossen

Georg-August-University Göttingen, Germany

Poster

Neuroligins (NLGNs) are a group of postsynaptically expressed proteins which contribute to the formation and maturation of synapses in both vertebrates and invertebrates, ensuring stable and correct connections between nerve cells. Mutations of neuroligin encoding genes in humans have been associated with the so called autism spectrum disorders (ASDs). ASDs are characterized by deficits in social interactions, communication impairments and repetitive behaviours. But behavioural effects of NLGN mutations have also been implied in Drosophila melanogaster, which possesses four NLGN genes.

In the presented study, we investigate the role of one of these genes, dnl4, and its effect on the flies behaviour. Drosophila normally shows stereotypical courtship and aggression behaviour towards con-specifics. We therefore investigated, whether this behaviour was altered or reduced in dnl4-deficient mutants, by analysing video recordings of flies and assessing their performance using a custom software. Furthermore, we wanted to analyse if any alterations in behaviour were due to an effect on the auditory system, resulting in the inability to acoustically perceive courtship songs or aggression sounds, or if the effect resulted from a direct effect on the neuronal circuits controlling behaviour. We therefore studied the physiological ability of dnl4-deficient flies to perceive sound using a Laser-Doppler-Vibrometer, combined with electrophysiological recordings of the auditory system.

Movement Feedback Signal Processing in a Curve Stepping Stick Insect: Task and Segment Specific.

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Walking animals constantly have to adjust their leg movements to a given motor task. Changes during curve walking are generated by specific modifications in the kinematics of each leg on both sides of the animal: a middle outside leg generates large amplitude, longitudinally directed stance movements, whereas the inside leg generates small amplitude stance movements with marked tibial flexion (Gruhn et al., 2009). Hellekes et al. (2012) showed previously that task-specificity in curve stepping kinematics is accompanied by differences in the processing of movement-related feedback on both sides of the curve walking animal. Flexion signals from the Femur-Tibia (FTi-) joint, reported by the femoral chordotonal organ (fCO), induce reinforcement of the Flexor tibiae more often on the inside than on the outside.
In the present study, we asked, if different parameters of tibial movement are processed differently between inside or outside steps, and if the same parameters of tibial movement are processed differently during directional stepping.
To answer this, we stimulated the middle leg fCO with a large range of stimulus velocities, amplitudes of FTi-joint movement, and starting angles, while recording tibial motoneuron and muscle activity in curve walking animals.
Our results show that the occurrence of movement reinforcement during inside and outside steps caused by fCO flexion signals is in both cases mostly dependent on starting angle and the velocity of FTi-joint movement (cf. Bässler,1988). However, the thresholds for eliciting the response are lower for the inside leg. It is quite conceivable that during curve stepping such differences in processing of tibial movement signals support leg kinematics generated on each side. To explore the mechanism behind this difference, we currently perform intracellular recordings from tibial motoneurons and premotor interneurons (cf. Driesang and Büschges, 1996).

Ionic currents during rhythm generation and coordination of activity

Laura Schläger, Carmen R. Smarandache-Wellmann

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The function of nervous systems is based on the interaction of neuronal networks. These are built of neurons with individual activity patterns that together regulate and coordinate complex movements and behavior. To understand the properties of such networks, we investigate the crayfish swimmeret system. Swimmerets are four pairs of abdominal limbs that move well-coordinated, in alternating power- and return strokes. Each hemiganglion possesses a similar subset of neurons that drive this movement. This is composed of five interneurons forming the pattern generating circuit (CPG), three coordinating neurons and motor neurons (MNs). When the system is active, all of these neurons show membrane potential oscillations (MPOs), but with distinct activity patterns. Despite our good understanding of the cellular components and synaptic contacts among them, the intrinsic mechanisms that enable the individual activity pattern remain unknown. We performed single electrode current- and voltage-clamp recordings from dendritic arborizations of the neurons in the isolated abdominal nervous system of the crayfish. We bath applied channel blockers to identify ionic currents that are involved in generating the different activity pattern of the neurons. We found no evidence of the hyperpolarizing activated cation current (IH). This is remarkable since it was shown in other systems to be important in generating MPOs. This led to further investigations regarding the origin of the MPOs. After application of channel blockers against the high voltage activated calcium current IL (Nifedipine), the transient potassium current IA (4-AP) or the persistent sodium current INaP (Riluzole) we could observe an altered ability of the system to produce a steady and coordinated motor rhythm. We could see a major importance of IL in shaping the activity of CPG neurons, coordinating neurons and MNs. IA seemed to be rather important for CPG neurons and coordinating neurons, while INaP seemed to influence mainly CPG neurons alone.

Poster

The Effect of Descending Input on a Locomotor System

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The swimmeret system of the crayfish is an easily accessible model for studying locomotion. The general network properties of the system and the coordination of CPGs that underlies this coupled activity were previously investigated in detail. Consequently it is of great interest to understand the effect of descending input from the brain on the coordination of the swimmeret CPGs.

In this comparative study separated axon bundles in the connectives of the abdominal nerve cord were stimulated electrically. Stimulation induced and terminated rhythmic activity in inactive and active preparations, respectively. In the signal crayfish, Pacifastacus leniusculus, electrical stimulations affected both sides of the nervous system in the same manner. Rhythmic activity was initiated or terminated bilaterally to the same extent. In contrast, asymmetric rhythmic activity (i.e. rhythmic activity solely ipsilateral to the stimulated axon bundles) could be induced in the galician crayfish, Astacus leptodactylus. In intact crustaceans this behavior is known as a righting response of the swimmeret system due to spatial movements of the animal. Bath application of carbachol, a nicotinic and muscarinic analog of acetylcholine that increases the excitation of the swimmeret system, increased the stimulation effect on the side of the abdominal nerve cord that was contralateral to the stimulation side. This suggests that the ipsilateral or bilateral initiation of swimmeret movements depends on the system's excitation level.

With increasing stimulation frequencies the period of the evoked rhythmic activity decreased and more motor neurons were recruited. These results, in addition with intracellular recordings of motor neurons during sub-threshold stimulations, give evidence that both the swimmeret motor neurons and presynaptic interneurons of the pattern-generating micro-circuits are affected by descending input.

Poster

Adaptation-induced modification of motion selectivity tuning in visual tectal neurons of adult zebrafish

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In the developing brain training-induced emergence of direction selectivity and plasticity of orientation tuning appear to be widespread phenomena found in the visual pathway across different classes of vertebrates.
Moreover, short-term plasticity of orientation tuning in the adult brain has been demonstrated in several species of mammals. However, it is unclear whether neuronal orientation and direction selectivity in non-mammalian species remains modifiable through short-term plasticity in the fully developed brain. To address this question we analyzed motion tuning of neurons in the optic tectum of adult zebrafish by calcium imaging. In total, orientation and direction selectivity was enhanced by adaptation, responses of previously orientation-selective neurons were sharpened and even adaptation-induced emergence of selectivity in previously non-selective neurons was observed in some cases. The different observed effects are mainly based on the relative distance between the previously preferred and the adaptation direction. In those neurons, in which a shift of the preferred orientation or direction was induced by adaptation, repulsive shifts (i.e., away from the adapter) were more prevalent than attractive shifts. A further novel finding for visually induced adaptation that emerged from our study was that repulsive and attractive shifts can occur within one brain area, even with uniform stimuli. The type of shift being induced also depends on the difference between the adapting and the initially preferred stimulus direction. Our data indicate that, even within the fully developed optic tectum, short-term plasticity might have an important role in adjusting neuronal tuning functions to current stimulus conditions.

Poster

Grasping Re-planning Interferes with Working Memory during the Maintenance Process: Neurophysiological Evidence

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The present study focuses on the neuro-cognitive mechanisms behind manual actions and action flexibility, particularly, on the neurophysiological interactions between working memory processes (encoding, maintenance, retrieval) and grasping movement flexibility in terms of re-planning.
Thirty five participants were tested in a working memory (WM)-grasping dual-task paradigm which required performing the verbal and visuospatial version of a WM task being embedded in a grasp-to-place task. To investigate the neuro-cognitive costs of implementing a new movement plan for WM, 30% of the trials required re-planning of the ongoing grasping movement. Therefore, the present study rested on a 2 (WM domain: Verbal and visuospatial) x 2 (Movement planning: Pre-planned and re-planned) within subject design. The event-related potentials (ERPs) were analyzed separately for encoding, maintenance and retrieval WM processes.
The ERP results showed the re-planning effect during the maintenance process. That is, there are different WM-related ERPs in the pre-planned condition and in the re-planned condition for both domains. There was no interaction for encoding and retrieval processes. Behavioral results also supported to the ERP findings showing a lower memory performance for both WM tasks in the re-planned compared to the pre-planned condition.
Here, we showed the initial characterization of neurophysiological interactions between cognition (WM processes) and manual action flexibility (grasping movement flexibility). That is, there are process-specific neuro-cognitive costs of grasping re-planning for the maintenance process of both verbal and visuospatial domains. These findings provide an empirical basis for further neurophysiological investigations of cognitive mechanisms of manual action flexibility.

Poster

Age-related changes in saccadic adaptation

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Saccadic eye movements provide an opportunity to study closely interwoven perceptual, motor, and cognitive changes during ageing. We aimed to study how age affects the ability of the oculomotor system to compensate for systematic foveal endpoint errors.

We investigated adaptation in a double step paradigm. Subjects had to make saccades to a target at 10 deg eccentricity which was displaced to 7.5 deg after saccade onset. Adaptation was embedded in a baseline and a post-adaptation epoch without manipulation of target position. We compared performance in young (N=12, mean age=28.0 years) and senior (N=11, mean age=66.5) subjects. We determined rate of adaptation by fitting an exponential function to the saccadic gain data.

All observers showed saccadic adaptation. At the end of the adaptation period, the average saccade gain was reduced to 0.86 relative to 1.00 during the baseline period. The overall amount of adaptation differed between the two age groups, being stronger for the young group (16% versus 10%, $t(21)=-2.9$, $p<.01$). Age groups did not differ in the rate of adaptation, 65 vs. 85 trials to reach 67% decay ($t(21)=-1.2$, $p>.25$). Differences seem to emerge from fast adaptation phase processes at the beginning of the adaptation, possibly due to strategic effects.

Poster

Circuit Analyses of consolidated memory in Drosophila

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Memory consolidation theory categorized memories in relation to whether it resists an amnestic treatment, or not. The Drosophila aversive odour-learning is a Pavlovian regimen where fruit flies are trained to avoid an olfactory cue- the conditioned stimulus (CS)- after it has been presented in combination with an electric shock i.e., the unconditioned stimulus (US). However, the Drosophila aversive learning comprises of two different types of consolidated memories, i.e., long-term memory (LTM) and Anesthesia-resistant memory (ARM).
Bruchpilot (Brp) is a ubiquitous presynaptic active zone protein which is needed for olfactory memory. Bruchpilot was revealed to facilitate efficient vesicle release particularly at low stimulation frequencies. Thus, transgenic knockdown of Bruchpilot in the olfactory circuit of the fruit fly, showed the necessity of Bruchpilot in the formation of the consolidated part of memory (ARM). Bruchpilot effects on ARM were further observed throughout the olfactory circuit.
This then affirm that, the effects observed in the circuitry depended on the low stimulation frequency of the Bruchpilot needed for effective synaptic release. Thus, effective synaptic release is pivotal for the formation of Anesthesia-resistant memory (ARM). The neurons that showed this effect revealed a certain pattern of conformity which depended on whether they were phase-locked or not. This phase locked phenomenon spanned from the antennal lobe local interneurons (LN2), and then further elicited in the Projection neurons and the mushroom body.

Lechner HA, Squire LR, Byrne JH. 100 years of consolidation–remembering Muller and Pilzecker
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Tully T, Preat T, Boynton SC, Del Vecchio M. Genetic dissection of consolidated memory in Drosophila
Yin JC, Wallach JS, Del Vecchio M, Wilder EL, Zhou H, Quinn WG, Tully T. Induction of a dominant-negative CREB transgene specifically blocks long-term memory in Drosophila.

Where to place my home in a cluttered environment? A model analysis

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Navigation in cluttered environments is an important challenge for animals and robots alike and has been the subject of many studies trying to mimic and explain animal navigation performance with parsimonious and energy efficient algorithms. One such approach is the Average Landmark Vector (ALV) model, where the information contained in panoramic images is characterised by a two-component vector, which can subsequently be used to generate a homing direction for navigational purposes. This approach is very appealing from a biological perspective, as it is efficient in terms of both computation and memory and could thus plausibly be represented in the insect nervous system. We could show that an agent using the ALV algorithm for navigation will, moreover, implicitly avoid obstacles, and therefore does not require another dedicated collision avoidance method.

To further explore the possibilities of this type of homing strategy, we investigated the performance of a skyline-based ALV variant using systematic grid-based simulations in a virtual cluttered environment. We find that homing performance strongly depends on the location of the target in the environment. These results highlight the importance of proper nest placement for successful homing as well as showcasing the general applicability of such a skyline-based approach.

Poster

A fast, local, load-based mechanism for inter-leg coordination in freely walking insects

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In stable, coordinated walking, a leg supporting the body should lift off the ground only after another leg has touched down to take over its load. But how does a leg "know" when another leg has touched down? The properties of vertebrate and invertebrate load sensors suggest a smart and fast mechanism: The supporting leg detects another leg's touchdown by sensing the resulting reduction of its own load due to mechanical coupling. Here, we demonstrate the plausibility of this putative mechanism in freely walking stick insects, using a combination of motion capture, ground reaction force measurements, electromyography, and modeling. First, we show that the insect's load sensors (campaniform sensilla) can reliably encode the unloading of the supporting leg during walking. Based on joint torques, we predict that two sensor groups on the proximal part of the leg change their activity with the onset of unloading. Second, we show that the onset of unloading is linked to the loading of the posterior leg: (i) Unloading is closely preceded by the touchdown of the posterior leg; (ii) static mechanics predict that this leg takes over load most effectively; (iii) the muscle responsible for lifting the supporting leg is activated only after the unloading onset. We conclude that touchdowns of neighboring legs can be sensed locally through mechanical coupling and thus help to coordinate legs adaptively during walking. As other insects like cockroaches and flies have analogous load sensors on their legs, this coordination mechanism might be used to similar advantage across animals.

Active vision strategies of bumblebees during learning flights

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Poster

Finding back the nest is one of the most important tasks of a bumblebee to ensure the survival of the hive. When leaving the nest for the first time, foragers perform learning flights to gather visual information about the surroundings of the nest entrance.
Bumblebees are using a saccadic flight and gaze strategy to restrain the rotational components of their motion to a brief time interval called saccade. During intersaccadic intervals head rotations were previously concluded to be either negligible, which facilitate the extraction of distance cues relative to the bee (Boeddeker et al. 2015) or to be small, but actively controlled by the bee to allow for gaining distance information relative to the nest (Riabinina et al. 2014). Our current analysis has been designed to reconcile these conflicting interpretations. In the experiments a bee hive was connected to a flight arena via a vertical entrance, and departure flights of bumblebees were recorded with two high resolution cameras. This arrangement facilitates reconstruction of the head orientation and quantification of measurement noise. The reconstruction of these parameters during the learning flights allows us to determine potential points in space that may be fixated during the intersaccades. Analyzing the location of these points in the arena and their retinal displacement during intersaccadic intervals provides information about their potential significance for spatial vision and thus about the gaze strategy used by the bee during their learning flights.

Receptive fields of polarization-sensitive neurons of the central complex in the desert locust

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The desert locust Schistocerca gregaria is able to perceive the polarization pattern of the sky, which is characterized by electric field vectors, E-vectors, arranged tangentially along concentric circles around the sun. This pattern depends directly on the sun's position in the sky and may be used to determine geographic directions.
Specialized photoreceptors in the dorsal rim area of the compound eyes are sensitive to the plane of oscillation (polarization) of light. The central complex plays a key role in the integration of this information: Parallel pathways innervate the protocerebral bridge as well as the lower and upper divisions of the central body in the locust brain. Within the central complex, columnar and tangen-tial neurons establish connections between and within the neuropils. The protocerebral bridge is innervated such that E-vector orientation is represented topographically, mapping 180° variability over each brain hemisphere. While the E-vector tuning of the involved neuron types is relatively well known, their receptive fields regarding the celestial position of polarized light stimuli have not been determined yet.
To map these receptive fields, we recorded intracellularly from polarized-light sensitive neurons of the central complex while presenting blue light stimuli using a rotating polarizer at different positions on the hemisphere. Neurobiotin tracer injection allowed for identification of neuron types and reconstruction of anatomical relationships. We found that individual columnar neurons have receptive fields directed at different parts of the sky, which might indicate that the protocerebral bridge topography maps the solar azimuth over the complete horizon around the animal.

Modeling motion adaptation in the visual system

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Poster

Insects flying in cluttered environments rely on spatial information in various behavioral contexts. The relative distance to surrounding objects can be extracted from the retinal image flow induced during self-motion.
Retinal image motion is computed by an array of retinotopically arranged motion detection circuits in the 2nd neuropile of the insect visual system. The output of these motion detection circuits is spatially pooled by a cluster of large-field motion sensitive neurons in the 3rd neuropile. Electrophysiological experiments revealed that the large-field motion sensitive neurons adapt during motion stimulation, i.e., when experiencing retinal image flow at a constant velocity the cell response reduces over time; however when an abrupt change in velocity occurs, the sensitivity to the change is maintained or even enhanced over time. Further experiments suggested that the motion adaptation observed in the largefield motion sensitive neurons is the consequence of adaptive processing mainly at the level of the local motion detection circuits.
We hypothesize that this local motion adaptation can enhance spatial information based on optic flow thereby facilitating flight control. We test this hypothesis on the basis of computational modeling and developed a novel adaptive model of the local motion detector, which is based on the same adaptive principle as can account for brightness adaptation in photoreceptors. This adaptive model can account for various adaptive features observed in the large-field motion sensitive neurons, suggesting common principles of adaptation at the different processing stages of the visual motion pathway. This model will allow us to further validate our hypothesis about the functional significance of local motion adaptation.

On the role of vision and gravity in head-body coordination of freely walking blowflies

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Most animals try to keep their visual systems horizontal during locomotion and show compensatory head movements to achieve this. In walking animals the orientation of the body is constrained through its direct leg-based contact with the often uneven walking substrate, making head-body coordination very important. Gravity and visual information are likely to be the most important cues for most animals to determine the orientation of their surroundings and thus of their visual systems. We investigated how these cues are employed by walking blowflies, which - despite being known mostly for their acrobatic flight behavior - frequently explore their environment by walking. We recorded freely walking animals and reconstructed the orientation of head and body while approaching an object in a cylindrical arena. In our experimental analysis, gravitational and visual cues available to the animal were brought systematically into conflict with each other. We discovered that walking blowflies employ both visual and gravitational cues to orient their head and thus their visual system. When both cues are brought into conflict blowflies reach a compromise between the orientations reported by the different cues, weighing them differently depending on their availability. The presence of visual cues reduce head rotations compensating for gravity, if they are aligned with the orientation of the ground, or enhance them, if they are congruent with the direction of gravity.

Poster

Optic flow based distance coding in the H1 cell of the blowfly

Frauke Lauterbach, Miriam Henning, Martin Egelhaaf, Roland Kern

Department of Neurobiology, Bielefeld University, Germany

Despite their small brains, flying insects perform astonishingly well when navigating through cluttered environments. A source of spatial information accessible to their visual system is the optic flow induced by translatory ego-motion. There are a variety of motion sensitive neurons in the insect brain that may accomplish this task.
We recorded from one such neuron, called H1, which spatially pools over a large array of local elementary motion detectors (EMDs). We stimulated one eye with videos depicting translatory movement along a straight path in environments of varying spatial complexity. To vary the number of stimulated EMDs and, therefore, examine the consequences of spatial pooling onto distance coding, the receptive field of the neuron was restricted by a mask of variable size. The effect of objects of different distances upon the cell response was then examined.
As the responses to simulated motion in simple environments show, spatial information intrinsic to EMD responses is still apparent after spatial pooling. The relationship between neuronal response and distances in naturalistic environments is less directly apparent. Correlations still reveal the nearness to be the strongest driving force of the cell response when compared to contrast or brightness. A systematic search for the distance represented best by the cell response also highlights the importance of close objects.
We therefore conclude that the neuronal response at the EMD level depends on multiple parameters characterising the visual scene. However it is dominated by distance when close objects are present. EMD responses might therefore extract the spatial information necessary to perform spatial vision tasks such as collision avoidance.

Poster

Passive versus active sensing: a giant descending interneuron in a stick insect conveying information about antennal movement.

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2 Cognitive Interaction Technology — Center of Excellence, Bielefeld University, Germany.

Stick insects use their antennae to continuously search and sample the environment ahead during walking. Carausius morosus executes aimed front leg movements towards obstacles shortly after tactile localisation by its antennae. The information required for this behaviour could be conveyed by previously identified descending interneurons that connect the brain to the thoracic ganglia. For example, the contralateral on-type velocity-sensitive neuron (cONv) encodes contralateral antennal joint angle velocity but also responds to low amplitude substrate vibration. How can cONv reliably encode single-trial joint movement in the presence of its strongly fluctuating spontaneous activity and how does it respond depending on the behavioural state of the animal and the mode of stimulation (movement or vibration)?
These questions were studied by electrophysiology and antennal motion tracking in otherwise stationary animals. Substrate taps at a rate comparable to stepping during walking are reliably encoded by a single spike per tap, while suppressing spontaneous (i.e., irregular) spike activity. Thus, the presence of substrate vibration may improve the encoding of antennal movement cues. The response of cONv to passive deflection of the antenna is reliable, strong and velocity-dependent. However, spontaneous activity of cONv is unchanged or even suppressed during active transient or rhythmic exploratory antennal movements, while its sensitivity to passive deflection persists. Provided that the response to passive deflection is similar to the response to interrupted active movement, cONv could serve as as a reliable antennal contact detector under behaviourally relevant conditions.

Poster

Haptic aftereffect of softness

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Present perception can be influenced by past sensory experience (temporal adaptation). This study addresses the impact of adaptation on haptic perception of softness. We conducted two experiments in which in every trial participants compared two silicon rubber stimuli (reference and comparison). They indented them simultaneously with their index fingers and decided which one felt softer. To change the sensory past of one index finger (adaptation condition) participants indented repeatedly a third stimulus (adaptation stimulus) with one index finger before they explored the reference stimulus with it. In the two experiments we used different reference stimuli, one was rather hard (0.32 mm/N) the other rather soft (0.67 mm/N). In both experiments we used as adaptation stimuli one harder, one softer and one stimulus with approximately the same compliance as compared to the reference. A forth adaptation stimulus was chosen to match the physical distance to the reference of one of the other adaptation stimuli. In a baseline condition both index fingers had no recent sensory past. We measured Points of Subjective Equality (PSEs) of the reference stimuli to corresponding sets of comparison stimuli. After adaptation, PSEs shifted as a function of the compliance of the adaptation stimulus in both experiments. The references were perceived to be softer after adaptation to a harder stimulus and harder after adaptation to a softer stimulus as compared to the condition without adaptation. These findings suggest that softness is an independent primary perceptual quality.

Poster

Enhancing Golf Putting Performance by Neurofeedback Train

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Neurofeedback training (NFT) is a technique to improve the brain's functioning through self-regulation of the electroencephalogram (EEG). Among the EEG signatures regarding focused attention, sensorimotor rhythm (SMR) activity has been related to the adaptive focused attention during skilled action execution. However, few studies have bridged the causal link between SMR activity and sports performance. This study investigated the effect of SMR neurofeedback training (SMR NFT) on golf putting performance. We hypothesized that pre-elite golfers would exhibit enhanced putting performance after SMR NFT. The increased SMR power after training would be a result of improved focused attention which may reduce the irrelevant motor information processing in the sensorimotor cortex. Method: Sixteen pre-elite golfers were recruited and randomly assigned into either an SMR or a control group. Participants were asked to perform 40 putting trials while EEG was recorded, both before and after intervention (8 sessions). Results: Our results showed that the neurofeedback group performed more accurately when putting [pre-post comparisons; $t(7) = 3.42$, $p = .011$] and exhibited greater SMR power [$t(7) = 2.93$, $p = .022$] than the control group [no significant effects] after 8 intervention sessions (significant interactions of group x session; $F(1,14) = 5.03$, $p = .042$; $F(1,14) = 33.19$, $p = .001$, respectively). With our control analysis, we found that the higher SMR power mainly presented at the sensorimotor area and exhibited less fluctuation in other frequency bands in the neurofeedback group after training. Furthermore, the neurofeedback group exhibited a day-to-day learning curve in which they improve the ability to control the SMR power from the first session of training to the last session. Discussion: This study concludes that SMR NFT is effective for increasing SMR power during action preparation and for enhancing golf putting performance. Moreover, greater SMR activity might be an EEG signature of improved focused attention which can induce superior putting performance.

Poster

A Multisensory Compass for Indoor Navigation

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Poster

HECTOR is a **HE**xapod **C**ognitive au**T**onomously **O**perating **R**obot. The goal of this project is to provide HECTOR with reliable information about the outside world and his internal states.
Autonomous systems regularly come with multiple sensors for vision, tactile information and proprioception. These and other sensors are providing complementary and redundant information. For control, information from internal and external sensors has to be combined uniquely.
However, information uncertainty from sensor noise, inaccuracy, and ambiguity is affecting the optimal way of combining information. This problem is complicated due to the uncertainty undergoing permanent changes while acting in the world, making continuous updating necessary.
Furthermore, in a miscalibrated redundant system, the problem of error assignment is inevitable. These problems call for efficient ways of uncertainty estimation and optimisation of the integration strategies. Multisensory integration and recalibration processes in humans, as well as their comparison to ideal observer models have been studied extensively. Still, it is largely unknown how uncertainty is estimated online for establishing correspondence, or for recalibration and optimally integrating multisensory information.
Just like any animal, HECTOR is equipped with vast sensorization providing the necessary information both for the low-level control of the legs movement and their coordination as well as the high-level control of the body motion. The sensors mimic biological sensory modalities such as proprioception (joint-angle sensors), a vestibular system (accelerometers, gyroscopes), touch (load/strain sensors), and vision (insect-like camera system).
Each sensory subsystem delivers only imprecise and sometimes even inaccurate estimates about the state of the own body and the external world. Integrating information from the different subsystems will make these estimates more precise and robust.

Multisensory integration of both ON and OFF-stimuli via correlation detection

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Multisensory integration is a process whereby the brain selectively integrates redundant information from different sensory channels. In a recent study we proposed a new model for multisensory integration inspired by the Hassenstein-Reichardt detector which detects and integrates redundant information from vision and audition. Here we investigate how unisensory information is pre-processed before being integrated. Specifically, we look into whether signal intensity or changes in intensity are preserved.
We presented audio-visual stimuli while parametrically varying the time lag between the two modalities. In the first experiment light and sound either increased in intensity (ON-stimulus) or decreased in intensity (OFF-stimulus) in form of a simple step function; ON and OFF stimuli were paired in all possible combinations. In the second experiment the intensity changed periodically. Participants were asked to perform a temporal order judgement and a simultaneity judgment. Results showed that subjects could accurately perform the given tasks regardless of the polarity of the intensity changes in sound and light.
To account for these results, we propose a revised multisensory correlation detector model (MCD) in which unisensory signals are first processed using a change detector and then fed into the correlation detector. Without fitting parameters, our revised model closely replicated the empirical results, thus demonstrating its capability in making accurate predictions of human behaviour in a variety of psychophysical experiments. Furthermore, the model suggests that multisensory processing discards intensity information, but represents event timestamps.

Poster

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Mina Elhami Asl	Bilkent University
Olivier Bertrand	Bielefeld University
Felix Blumenthal	University of Cologne
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Anna C. Schneider	University of Cologne
Julia Sprenger	Jülich Research Centre
Björn Trebels	Philipps-University Marburg
Frederick Zittrell	Philipps-University Marburg

Wednesday	Thursday
	9:15 Coffee
	9:30 **Talk Session (1 - 4)**
	10:30 Coffee
	11:00 Plenary Lecture **James Poulet**
	12:00 **Lunch (Mensa)**
Hostel Check-In **from 15:00 - 22:00**	**13:30** **Talk Session (5 - 8)**
	15:00 Coffee
until 16:30 **Registration**	**15:00** **Poster Session (even)**
16:30 **Welcome Address**	
17:00 Plenary Lecture **Martin Egelhaaf**	**16:45** **Talk Session (9 - 12)**
19:00 **BBQ (CITEC)**	**19:00** **Dinner (CITEC)**

Friday	Saturday
9:15 Coffee	**Hostel Check-Out** until 9:00 am
9:30 **Talk Session (13 - 15)**	
10:30 Coffee	
10:45 **Talk Session (16 - 19)**	
12:00 **Lunch (Mensa)**	
14:00 **Talk Session (20 - 21)**	
15:00 Coffee	
15:00 **Poster Session (odd)**	
16:30 Plenary Lecture **Albert Newen**	**Awards** **+** **Next NeuroDoWo**
19:00 **Dinner (Downtown)**	

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